AFNI Jazzercise

Please read the following questions and use your AFNI know-how to answer them. Hints to answering these questions are available in the "Hints" handout. The answers to these questions can be found in the "Answers" handout.

1. The dataset **AFNI_data3/afni/`func_slim+orig`** contains 7 sub-bricks of statistical data. Use **`3dbucket`** to create a smaller version of this dataset that contains only the sub-bricks: #0, 3-6. Name this new dataset **some_stats**.

2. In directory **AFNI_data3/afni** you will find three anatomical datasets: **`anat1+orig`**, **`anat2+orig`**, **`anat3+orig`**. These datasets are 3 separate anatomical scans of a single subject. They have already been aligned. Average them together into a single dataset called **anat_mean+orig**. Notice that the result looks 'cleaner', since the noise has been reduced.

3. Use AFNI's two skull-stripping programs, **`3dIntracranial`** and **`3dSkullStrip`**, to remove the skull from dataset **AFNI_data3/afni/`anat+orig`**. Name the output file from 3dIntracranial **anat_3dIntra+orig** and the output file from 3dSkullStrip **anat_3dSkull+orig**. Compare the two output datasets. Did one program do a better job at skull stripping or are the results similar? (Note: 3dSkullStrip may take a few minutes to run so be patient).

4. Creating and Playing with ROI Masks:
   a. The dataset **AFNI_data3/afni/`func_slim+orig`** has beta values and t-stats for 2 stimulus classes, fpos and fneg. Use **`3dcalc`** to create a mask called **PN_mask** that is **1** everywhere that both the fpos t-stat and the fneg t-stat values are greater than 4.2, and **0** everywhere else.

   b. Similar to part a, create a conjunction mask that is **1** wherever a>4.2 (from fpos t-stat sub-brick), **2** wherever b>4.2 (from fneg t-stat sub-brick), **3** wherever both are true, and **0** otherwise. Name this dataset **PN_mask_4+orig** (since it contains 4 values).

   c. Use the afni GUI to display this mask, **`PN_mask_4+orig`**, so that each mask value gets its own color. What does each color mean?

   d. Use **`3dROIstats`** to store the average time series from **`epi_r1+orig`** into the text file **PN_mean.1D**, where the mean is over the voxels in the mask (from part a), **`PN_mask+orig`**.

5. Fun with 1D files:
   a. Create three 1-column files with the numbers 1-10 in one column of the first file, 11-20 in the second file, and 21-30 in the third file. (note: you might use 2 different AFNI programs to create each file)

   b. Catenate these 3 files into one 3-column file. Call this 1D file **3_cols.1D.**

   c. Create a new file that contains columns 1, 2, 3, 3, 2,1, from part b (i.e., there will be a total of 6 columns in this new 1D file). Call this new 1D file **6_cols.1D**.

   d. Now take the 6 columns from question 7b and average them together to create a new file with a single column. Call that new file **ex_mean.1D**.

6. Fun with the AFNI GUI:
    a. Open **AFNI_data3/afni/`anat+orig`** and in any one of the views (sagittal, axial, or coronal), change the gray-scale intensity range to be 500 minimum and 1500 maximum.

    b. Open **AFNI_data3/afni/`func_slim+orig`** and set the Full-F as the OLay and Threshold. Set the Threshold to F=8.0. Show only Positive values and set the color scale to show only 8 colors. Edit the color scale so that F-values between 14 and 28 are shown in lime green.

    c. View the above settings you created from part b in a sagittal slice. Make a jpeg file from sagittal slice #166 and name it **cool_slide**.

    d. Switch to Talairach view and Talairach to the **right fusiform gyrus**.

    e. Change the display to show 6 sagittal slices all at once, in a 3x2 montage.

    f. Can you find the AFNI Mission statement hidden in the AFNI GUI?

7. Doing Calculations in AFNI:
    a. Determine what type of data (short, float, etc) makes up dataset **AFNI_data3/afni/`func_slim+orig`**.

    b. Calculate 22.3 * 44.5 using the simple calculating program in AFNI.

8. Image Filtering:
    a. Smooth **AFNI_data3/afni/`epi_r1+orig`** with a 8mm FWHM filter. Name the output file **ex_blur8**.

    b. Enhance **AFNI_data3/afni/`anat+orig`** by emphasizing the minimum-valued voxels across +/- 3 voxels in the sagittal (z) direction. Name the output dataset **ex_minz3**.

    c. Enhance dataset **`ex_minz3+orig`** from part b by removing the noise with program **`3danisosmooth`**. Name the output dataset **ex_aniso**. Use the **-viewer** option in this program to select the number of noise-removing iterations.

    d. Use AFNI's Winsorizing program to apply a 3D Winsorizing filter to dataset **AFNI_data3/afni/`anat+orig`**. This filter is used to improve the gray-white matter contrast in an anat volume. Add an option on the command line to repeat the filter 5 times (the default runs the filter only once). Give the output file the prefix name **anat_winsor**. Compare the original and the Winsorized datasets to see if there is any difference in the gray-white matter contrast.

9. Random Exercises with AFNI Datasets:
    a. Open dataset **AFNI_data3/afni/`anat+orig`** dataset and find the spatial storage order (i.e., xyz-orientation). Re-orient it to LPI orientation and name the new output dataset **exLPI**.

    b. Open dataset **AFNI_data3/afni/`func_slim+orig`** and create 2 separate datasets: one with the 3rd sub-brick only and one with the 4th sub-brick only. Call the former dataset **ex_fneg_coef** and the latter **ex_fneg_tstat**.

c. Combine **`ex_fneg_coef+orig`** and **`ex_fneg_tstat+orig`** from part b into a single dataset called **ex_fneg**, having the fneg Coef for sub-brick 0, and fneg t-stat for sub-brick 1.

d. Convert dataset **AFNI_data3/afni/`func_slim+orig`** to Talairach coordinates with a $4mm^3$ resolution. Use dataset **anat+tlrc** in the same directory as the data parent to perform the transformation on **`func_slim+orig`**. Name the output file **func_slim4mm**.

e. Locate the maximum "Full-F" stat voxel value in dataset **`func_slim4mm+tlrc`** and find the name of the Talairach atlas region that corresponds to that voxel's position.

f. Dataset **AFNI_data3/afni/`anat+orig`** was acquired sagittally and contains 124 slices. Create a new dataset that contains only slices 40-90 of anat+orig. Provide the new dataset with the prefix name **anat_40_90**.